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Emission CT Algorithm Development for NDE/NDA of Waste Drums[†]

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Abstract

We are developing a new emission CT algorithm for NDE/NDA of waste drums. Previously, we used an algorithm adapted from the medical imaging field to the drum scanning problem. During the course of the adaptation, we discovered that several assumptions which were valid for the medical imaging case were not valid for the drum scanning geometry and led to less accurate solutions. Particularly, the use of cubic voxels as the basis function for both emission and transmission images causes problems because the voxels are not rotationally symmetric. In this paper, we describe the design and development of our new algorithm, including the drum scanning geometry, use of consistent units, the choice of a basis function and interpolation techniques, the collimator response function, and the ability to implement several solution forms: MLEM, matrix solution, and constrained optimization. We show example assays from both simulations and real drum data.

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